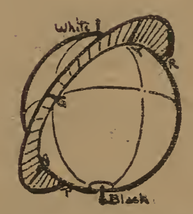
ATLAS

OF

The Munsell Color System



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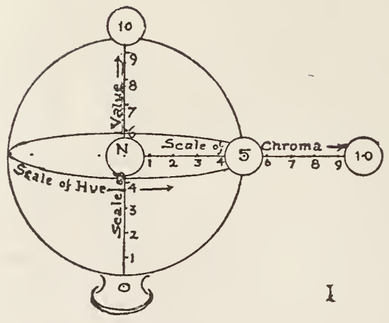
/ Atlas of the Munsell color system/

THE COLOR ATLAS.

THIS ATLAS CONSISTS OF TWO SETS OF CHARTS, ILLUSTRATING A SYSTEM OF COLOR MEASUREMENT OF WHICH THE FOLLOWING PARAGRAPHS GIVE A DESCRIPTION.*

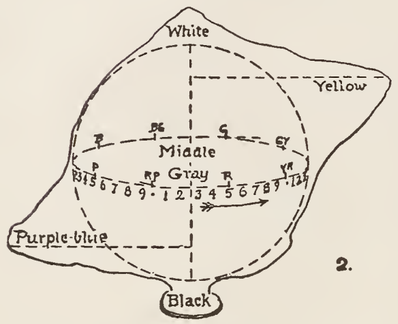


1

COLOR SPHERE

AND

COLOR TREE



2.

1. THREE COLOR SCALES UNITE IN A SPHERE.

Imagine a colored sphere with white as its north pole, black as its south pole, and its equator ringed about by a circuit of red, yellow, green, blue and purple hues—each of which melts imperceptibly into its neighbors, Fig. 1, *Thus the equator traces the horizontal scale of hues: H.*

Imagine each equatorial hue as graded upward to white and downward to black in regular measured steps. Each hue then presents a scale of values over the surface, while *the axis traces the vertical scale of gray values: V.*

Imagine surface colors weakened by additions of neutral gray as they pass inward to disappear in the vertical axis. The sphere is thus filled with gradations of color,—lighter degrees above the equator, darker degrees below; stronger degrees outward, and weaker degrees inward to the axis, where all color is balanced in neutrality. The degree of color strength at any point is known as *chroma* and is traced by radii at right angles to the axis. It represents the gradual emergence of each hue from grayness. *Each radius serves as a scale of chromas: C.*

Every color sensation may be measured and defined by these three scales of *hue, value,* and *chroma.* Neglect of either scale—that is, failure to state either the hue, the value, or the chroma of a color—creates doubt and confusion.

2. A COLOR TREE SURROUNDS THE COLOR SPHERE.

Were all pigment colors of equal chroma then a sphere would present an ideal of their relations. But pigments are very unequal in strength, Vermilion red,† for example, being twice as strong as its opposite complement, blue-green Viridian. This is shown in chart 40. The unequal scales of pigment chroma may be treated as branches of a Color Tree whose trunk is the neutral axis, while its branches of various lengths and at various levels blossom out with the strongest colors. This tree is imagined as compact of colored leaves—darker leaves below, lighter leaves above; most chromatic leaves on the surface and grayer leaves inward to the trunk, which is colorless. The tree also encloses the Color Sphere, which would appear were the longer branches lopped off to equal the length of the shortest branch. Fig. 2.

3. NOTATION OF COLORS BY SYMBOLS.

The place of each leaf of the Color Tree is determined by the measured scales of hue, value and chroma. These scales also furnish an expressive notation, made by the five color initials with their combinations and ten arabic numbers.

The scale of hue is a sequence of red (R), yellow-red (YR), yellow (Y), green-yellow (GY), green (G), blue-green (BG), blue (B), purple-blue (PB), purple (P), and red-purple (RP). The five principal hues melt perceptibly into intermediates by ten steps, of which the middle or fifth step is typical of that hue. The scale of values is also decimal from 0 (black) to 10 (white), and the scale of chromas likewise from 0 (neutral gray) to 10 (the strongest permanent pigment so far obtained).

A symbol completely describing the character of any color sensation is composed of its degrees of hue, value, and chroma. The symbol for what is commonly known as Vermilion is $5R\frac{4}{10}$ ("five red, four over ten"):—the numeral before R showing that it is the fifth or typical step of red in the hue scale, without tendency either to yellow-red or purple-red; the upper numeral showing that its luminosity equals the fourth step in the value scale, and the chroma numeral ten showing that it is of maximum strength. Chart H.

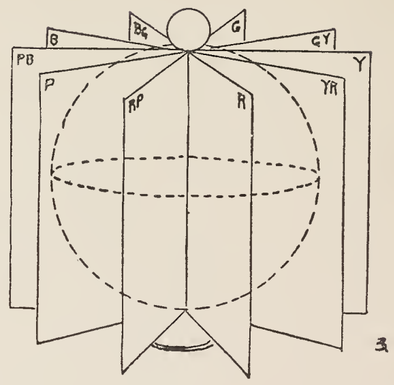
Should the Vermilion be changed by fading or admixture with another pigment, this would appear in the symbol:—thus a tinge of yellow in the red is written 6R while 4R indicates a tinge of purple; a slight addition of gray reduces the chroma to R_9, while the addition of white changes the value toR^5. Grouping all these changes in the symbol, $6R^5_9$, shows that the original Vermilion $5R\frac{4}{10}$ is no longer pure, but tinged with yellow, lightened with white, and weakened with gray.

4. CHARTS OF THE COLOR SYSTEM.

The measured scales of hue, value. and chroma are presented in two sets of charts, one made by vertical sections of the Color Tree, and the other by horizontal sections. Figs. 3 and 4.

There are eight vertical charts. *Chart H is the hue scale* arranged as an index for recording colors singly or in groups.‡ Vermilion appears in the column R at the level four and with the chroma symbol ten. *Chart V is the value scale* upon a hinged and perforated card, behind which to test the value of a color sample. Thus Vermilion seen through the perforations is darker than value five and lighter than value three. It matches value step four. *Chart C bears the chroma scales* of red, yellow, green, blue and purple as tree branches whose levels and lengths describe the relation of these maxima to the extremes of white and black. Vermilion appears as the strongest red chroma, and the color is written $5R\frac{4}{10}$.

The five remaining vertical charts are planes passed through the axis, on opposite sides of which appear the complementary fields of color. Chart R shows the red field with its complementary field of blue-green. By noting the symbol $5R\frac{4}{10}$ Vermilion may be balanced with any degree of its opposite blue-green. Chart Y shows yellow with its opposite purple-blue. Charts G, B, and P show green, blue, and purple with their appropriate complements, red-purple, yellow-red (orange), and green-yellow.

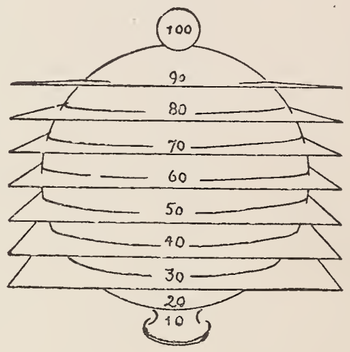


3

VERTICAL

AND

HORIZONTAL CHARTS.



4.

There are seven horizontal charts. The axis appears on each as the neutral gray centre of a star or radial pattern, the lengths of whose radii indicate the chroma of their hues. These sections present colors at a single uniform level of value:—thus, Chart 50 at the middle of the Color Tree bears only colors which reflect 50 per cent. of the luminosity of white, while Charts 40, 30, and 20 show darker levels, and Charts 60, 70, and 80 show the lighter levels of color.

5. BALANCE OF COLOR BY A SPHERE.

The sphere typifies balance of color.§ White and black balance at the centre on middle gray, N^5. Balanced colors appear at the ends of any diameter passing through the centre of the sphere. Also, a lighter color balances a darker, but when unequal values or chromas are employed the color of weaker chroma must be given the larger area. The symbols on each step of these color charts indicate the proportions needed to produce balance, as suggested in the text to be found on each chart.

*For fuller information the reader is referred to the author's "A Color Notation," 3d edition, Boston, 1913. †Vermilion red, the sulphuret of mercury, is the most chromatic of permanent colors. ‡See Chapter VI. of "A Color Notation."

§Models of A Color Tree and A Color Sphere have been designed to demonstrate the balance of color.

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MUNSELL COLOR SYSTEM

ATLAS
—OF—
COLOR CHARTS.

CHART
H

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SCALE OF HUES

RP 9 8 7 6 P 4 3 2 1 PB 9 8 7 6 B 4 3 2 1 BG 9 8 7 6 G 4 3 2 1 GY 9 8 7 6 Y 4 3 2 1 YR 9 8 7 6 R 4 3 2 1 RP

SCALE OF VALUES

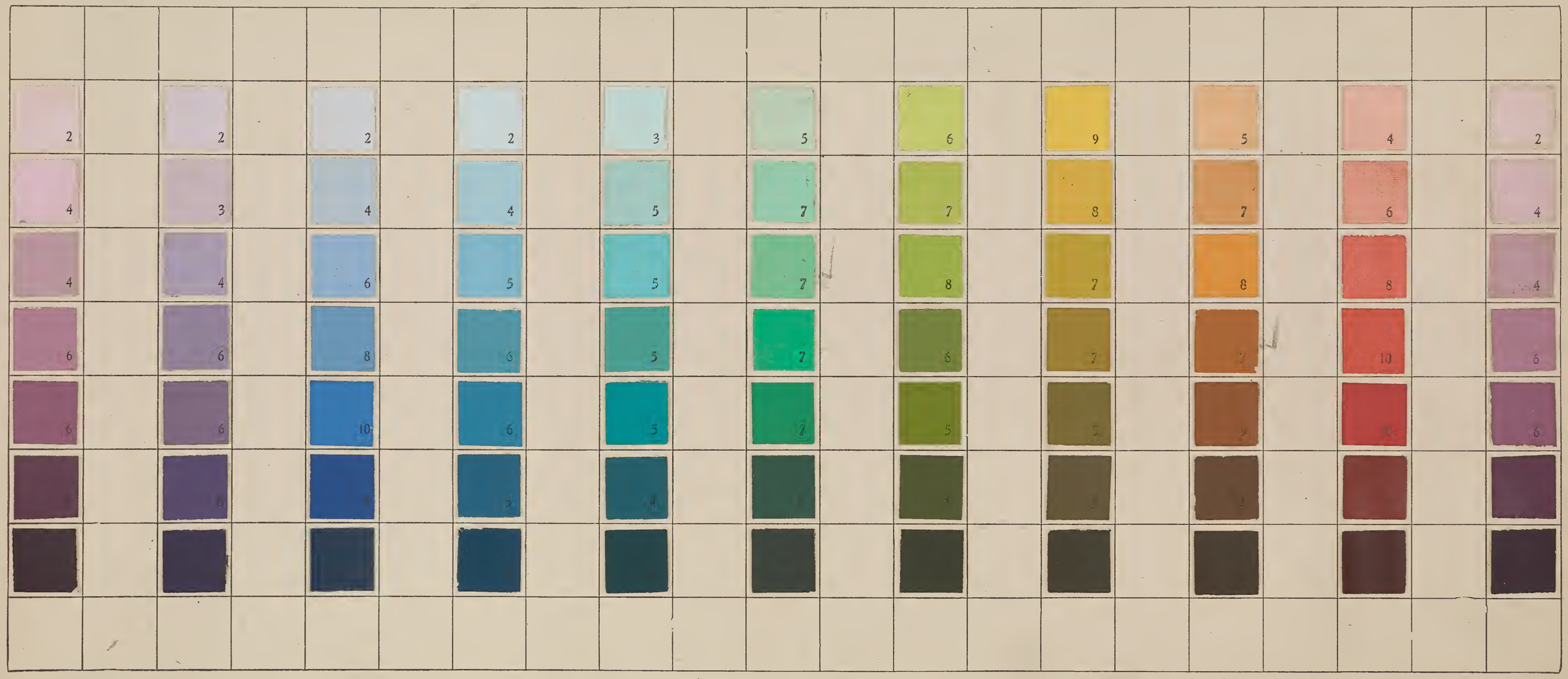

CHART H.

INDEX FOR COLOR NOTATION.

This chart suggests all color paths and records each step by a simple NOTATION. The ten steps of hue are written RP (red-purple), P (purple), PB (purple-blue), B (blue), BG (blue-green), G (green), GY (green-yellow), Y (yellow), YR (yellow-red or orange), and R (red).

Initials at the top of the chart trace the Sequence of Hues; numerals at the side trace the Sequence of Values and the small numeral printed on each color step is an index of its Chroma i,e. strength or saturation. The color step made of vermilion bears the chroma numeral 10;- it is at the value level 4:- and in the red column R. This step is written $5R\frac{4}{10}$ as explained in a previous introduction and in chapter VI of "A Color Notation."

If this chart were bent around the equator of the color sphere forming a cylindrical envelope, it would imitate a mercator chart of the globe, each hue taking the place of a meridian and each value level representing a parallel of latitude, while the chroma numerals would correspond to altitudes.

Were this cylinder cut open on the red-purple meridian (RP) it would spread out to form this Hue Chart;- green being at its center with yellow and red (warm hues) to the right, and the cool hues blue and purple to the left.

Colors shown on this chart form the *irregular outside* of the color tree, between which and the neutral gray trunk are the intermediate degrees of weaker chroma. which appear on the succeeding charts R. Y. G. B. P and 20. 30. 40. 50. 60. 70. 80. of the system.

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CHART
V

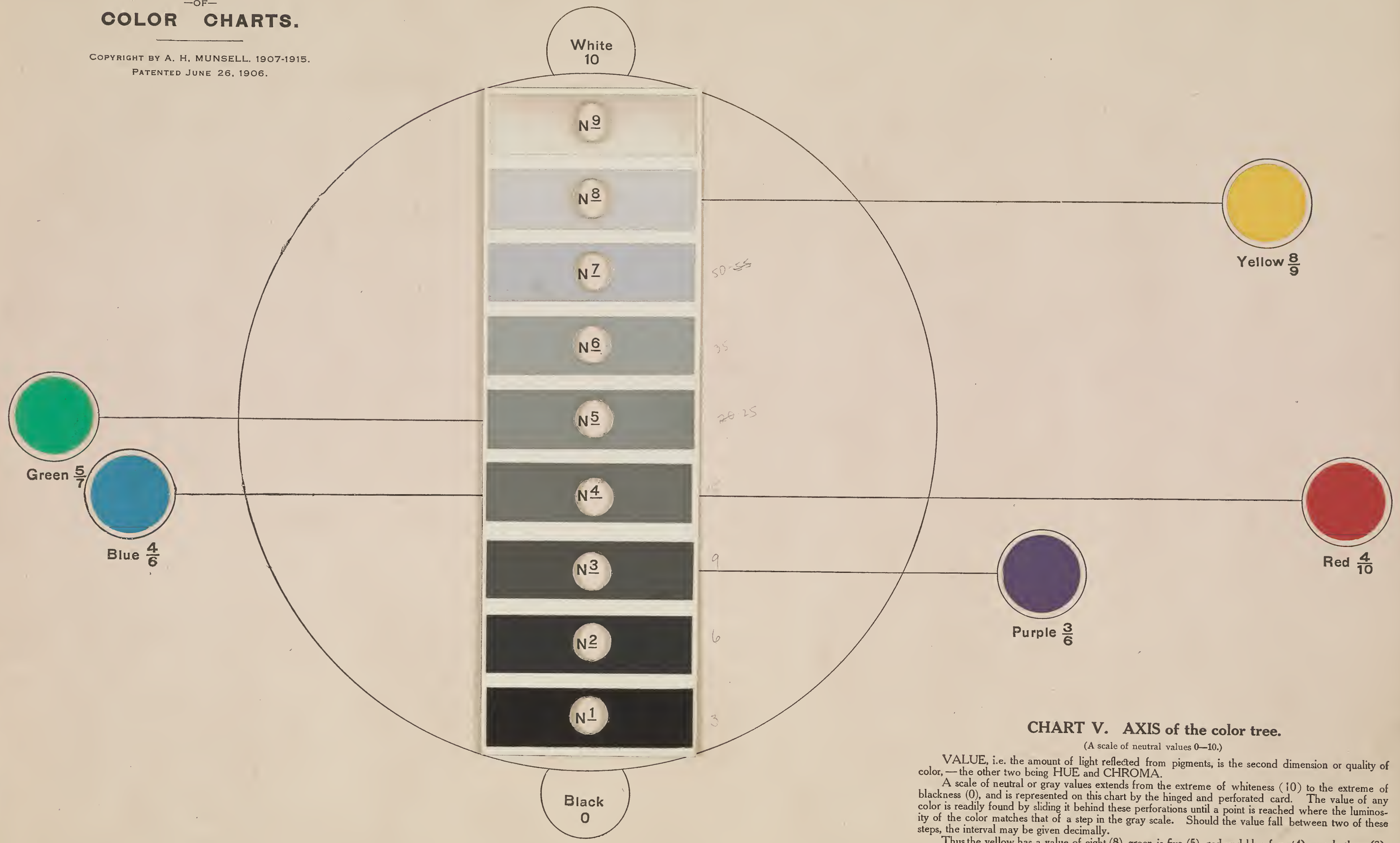

CHART V. AXIS of the color tree.

(A scale of neutral values 0—10.)

VALUE, i.e. the amount of light reflected from pigments, is the second dimension or quality of color, — the other two being HUE and CHROMA.

A scale of neutral or gray values extends from the extreme of whiteness (10) to the extreme of blackness (0), and is represented on this chart by the hinged and perforated card. The value of any color is readily found by sliding it behind these perforations until a point is reached where the luminosity of the color matches that of a step in the gray scale. Should the value fall between two of these steps, the interval may be given decimally.

Thus the yellow has a value of eight (8), green is five (5), red and blue four (4), purple three (3). Personal bias plays no part in this measured scale of value. It is established by a special instrument adopted in the course of optical measurements, at the Mass. Institute of Technology, and known as the Munsell Photometer.

These pigment colors vary not only in their VALUE, but also in their CHROMA,—as fully shown on Chart C, which explains why the color branches extending outward from the neutral axis are of uneven length. See chapters II and III of the teacher's handbook, "A COLOR NOTATION," (second edition).

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CHART

C

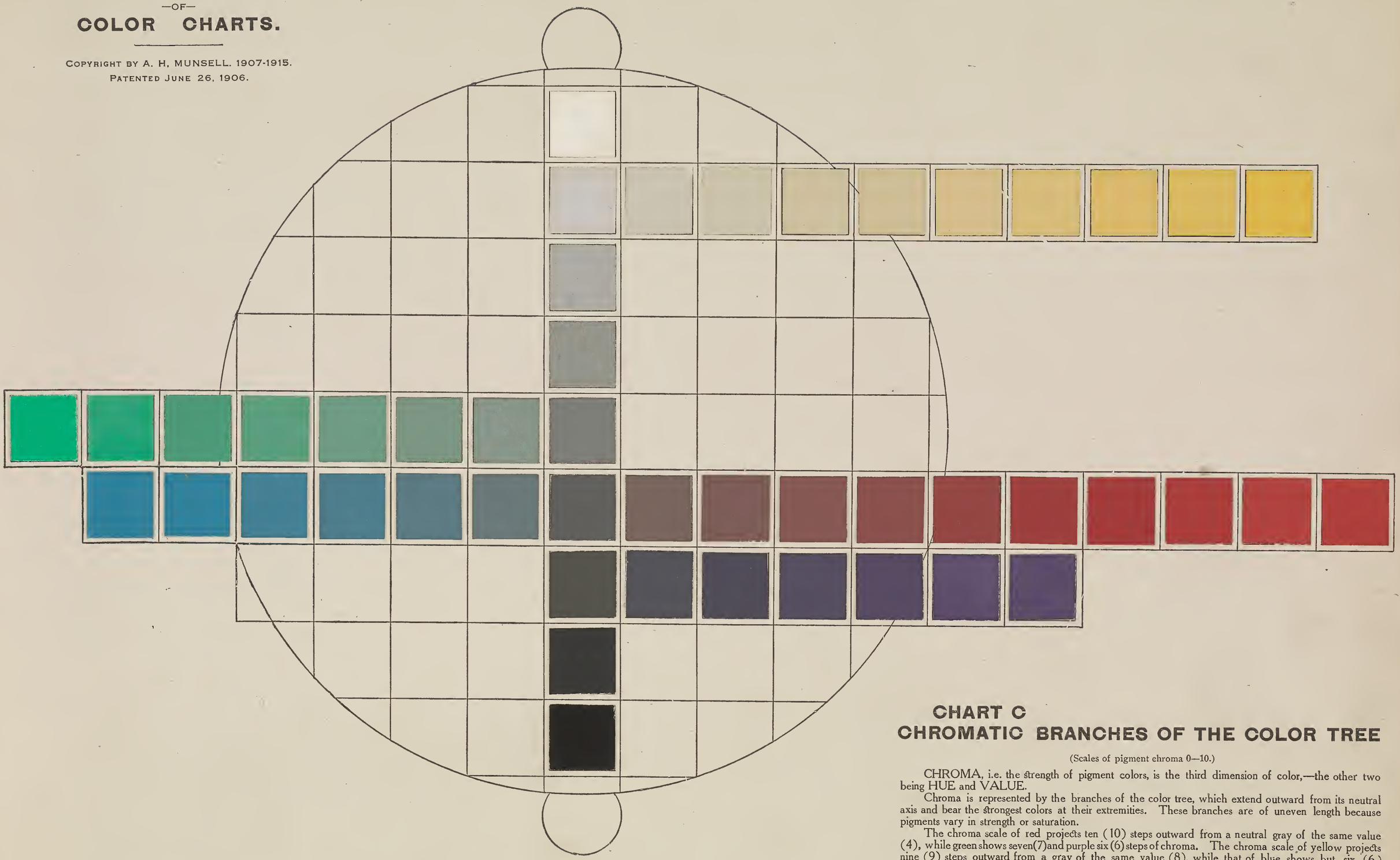

CHART C
CHROMATIC BRANCHES OF THE COLOR TREE

(Scales of pigment chroma 0—10.)

CHROMA, i.e. the strength of pigment colors, is the third dimension of color,—the other two being HUE and VALUE.

Chroma is represented by the branches of the color tree, which extend outward from its neutral axis and bear the strongest colors at their extremities. These branches are of uneven length because pigments vary in strength or saturation.

The chroma scale of red projects ten (10) steps outward from a neutral gray of the same value (4), while green shows seven(7)and purple six (6) steps of chroma. The chroma scale of yellow projects nine (9) steps outward from a gray of the same value (8), while that of blue shows but six (6) steps of chroma.

These scales are not due to personal bias or guess work, but have been scientifically established. They explain the unequal power of pigments, showing how far the "warm hues" red and yellow, outbalance the "cool hues" blue and green. The circle struck from N5 is the contour of the color sphere, within which all colors are balanced.

Measured scales of VALUE and CHROMA make it possible to define a color with exactness. See chapter VI of the teacher's handbook, "A COLOR NOTATION," (second edition).

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CHART
R

SCALE OF VALUES

9 8 7 6 5 4 3 2 1

10 9 8 7 6 5 4 3 2 1 N 1 2 3 4 5 6 7 8 9 10

SCALE OF CHROMAS

RED AND BLUE-GREEN CHART.

This chart presents a vertical plane passed through the axis of the color solid and bearing the complementary hues, red and blue-green. This pair of opposite hues is shown in regular measured scales from black to white, and from greyness to the strongest color made in stable pigment.

VALUES of red and blue-green range vertically from black (0) to white (10). CHROMAS or strengths of color range horizontally from neutral gray to the maximum (10).

Each step in these color scales bears an appropriate symbol describing its light and its strength. Thus R^{4}_{10} is vermilion, the standard red of the system, which exhibits 100% of chromatic strength and reflects 40% of the incident light. Its opposite BG^{4}_{5} reflects the same percentage of light but only 50% of chroma. To balance this pair the areas must be inversely as the chroma, i. e., since blue-green is but half as strong as vermilion red, twice as much is required for a balance. Attention to these measures leads to pleasing combinations.

Any chosen steps of red and blue-green upon this chart may be balanced by noting their symbols:- thus light blue-green (BG^{8}_{3}) balances dark red (R^{3}_{8}) when the areas are inversely as the product of the symbols viz:-six parts of light blue-green and twenty-four parts of dark red.

Chapters III and IV of the handbook, "A Color notation," describe these balances and their combinations with other hues. The symbol on each color step is its NAME, a measure of its light and strength by which it is to be memorized, written and reproduced.

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CHART
Y

SCALE OF VALUES
9 8 7 6 5 4 3 2 1

10 9 8 7 6 5 4 3 2 1 N 1 2 3 4 5 6 7 8 9 10
SCALE OF CHROMAS

YELLOW AND PURPLE-BLUE CHART.

This chart presents a vertical plane passed through the axis of the color solid and bearing the complementary hues, yellow and purple-blue. This pair of opposite hues is shown in regular measured scales from black to white, and from greyness to the strongest color made in stable pigment.

VALUES of yellow and purple-blue range vertically from black (0) to white (10). CHROMAS or strengths of color range horizontally from neutral gray to the maximum (10).

Each step in these color scales bears an appropriate symbol describing its light and its strength. Thus $Y\frac{8}{9}$ is zinc yellow, the strongest permanent yellow, which exhibits 90% of chromatic strength and reflects 80% of the incident light. Its opposite $PB\frac{8}{2}$ reflects the same percentage of light but only 20% of chroma. To balance this pair the areas must be inversely as the chroma, i. e., since purple-blue is but two ninths as strong as zinc yellow, it requires nine parts of purple-blue to balance two parts of the yellow. Attention to these measures leads to pleasing combinations.

Any chosen steps of yellow and purple-blue upon this chart may be balanced by noting their symbols:- thus light yellow ($Y\frac{8}{9}$) balances dark purple-blue ($PB\frac{3}{8}$), when the areas are inversely as the product of the symbols viz:- twenty-seven parts of light yellow and seventy-two parts of dark purple-blue.

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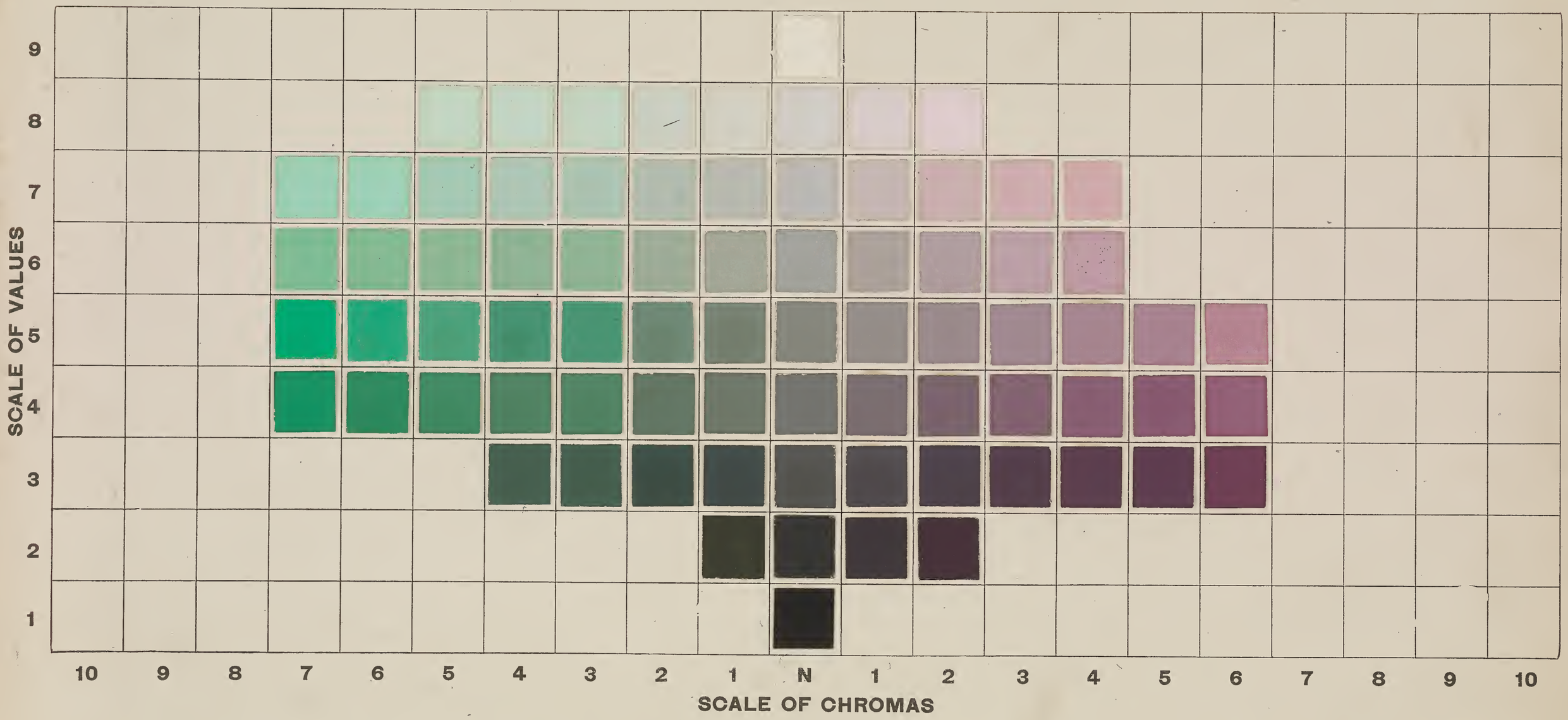
CHART
G



GREEN AND RED-PURPLE CHART.

This chart presents a vertical plane passed through the axis of the color solid and bears the complementary hues, green and red-purple. This pair of opposite hues is shown in regular measured scales from black to white and from greyness to the strongest color made in stable pigment.

VALUES of green and red-purple range vertically from black (0) to white (10). CHROMAS or strengths of color range horizontally from neutral gray to the maximum (10).

Each step in these color scales bears an appropriate symbol describing its light and its strength. Thus G^{5}_{7} is emerald green, the strongest permanent green, which exhibits 70% of chromatic strength and reflects 50% of the incident light. Its opposite RP^{5}_{6} reflects the same percentage of light but only 60% of chroma. To balance this pair the areas must be inversely as the chroma, i. e., since red-purple is one seventh less strong than green, seven parts of red-purple will balance six parts of the green, Attention to these measures leads to pleasing combinations.

Any chosen steps of green and red-purple upon this chart may be balanced by noting their symbols:, thus light green (G^{8}_{5}) balances dark red-purple (RP^{8}_{8}), when the areas are inversely as the product of the symbols viz:- forty parts of dark red-purple and four parts of light green.

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CHART
B

SCALE OF VALUES

9 8 7 6 5 4 3 2 1

10 9 8 7 6 5 4 3 2 1 N 1 2 3 4 5 6 7 8 9 10

SCALE OF CHROMAS

BLUE AND YELLOW-RED CHART.

This chart presents a vertical plane passed through the axis of the color solid and bears the complementary hues, blue and yellow-red. This pair of opposite hues is shown in regular measured scales from black to white, and from greyness to the strongest color made in stable pigment.

VALUES of blue and yellow-red range vertically from black (0) to white (10). CHROMAS or strengths of color range horizontally from neutral gray to the maximum (10).

Each step in these color scales bears an appropriate symbol describing its light and its strength. Thus $B\frac{4}{8}$ is cobalt, the strongest permanent blue, which exhibits 60% of chromatic strength and reflects 40% of the incident light. Its opposite $YR\frac{4}{5}$ reflects the same percentage of light but only 50% of chroma. To balance this pair the areas must be inversely as the chroma, i. e., since the yellow-red exhibits one sixth less strength than the blue, six parts of the yellow-red will balance five parts of blue. Attention to these measures leads to pleasing combinations.

Any chosen steps of blue and yellow-red upon this chart may be balanced by noting their symbols:- thus light yellow-red ($YR\frac{8}{8}$) balances dark blue ($B\frac{4}{5}$), when the areas are inversely as the product of the symbols viz:- twenty parts of light yellow-red ("orange") and forty-eight parts of dark blue.

Chapters III and IV of the handbook, "A Color Notation," describe these balances and their combinations with other hues. The symbol on each color step is its NAME, a measure of its light and strength by which it is to be memorized, written and reproduced.

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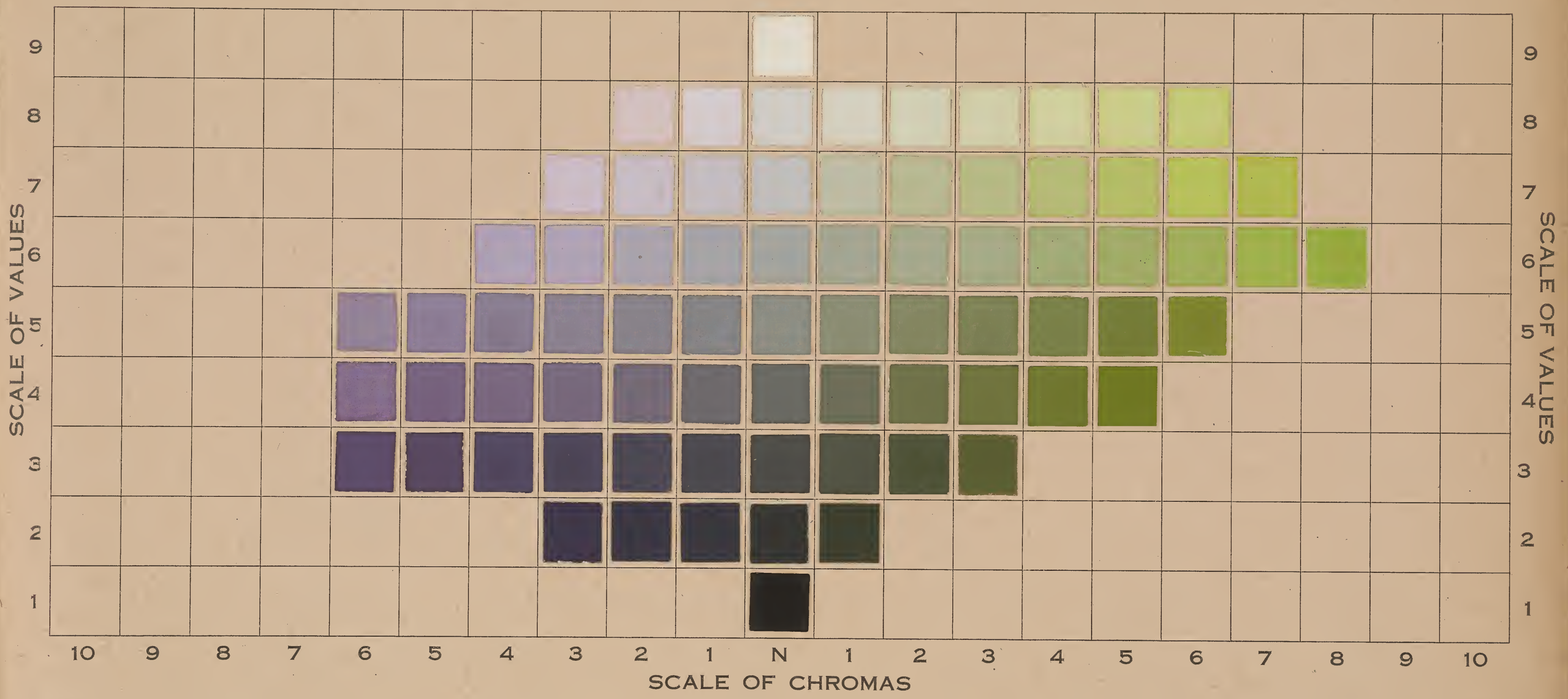
CHART
P



PURPLE AND GREEN-YELLOW CHART.

This chart presents a vertical plane passed through the axis of the color solid and bears the complementary hues, purple and green-yellow. This pair of opposite hues is shown in regular measured scales from black to white and from grayness to the strongest color made in stable pigment.

VALUES of purple and green-yellow range vertically from black (0) to white (10). CHROMAS or strengths of color range horizontally from neutral gray to the maximum (10).

Each step in these color scales bears an appropriate symbol describing its light and its strength. Thus P4/6 is a compound purple, the strongest permanent color, which exhibits 60% of chromatic strength and reflects the same amount of light as N 4/ of the value scale. Its opposite GY4/5 reflects the same amount of light but only 50% of chroma. To balance this pair the areas must be inversely as the chroma, i. e., since green-yellow is one-sixth less strong than the purple, six parts of green-yellow will balance five parts of the purple. Attention to these measures leads to pleasing combinations.

Any chosen steps of purple and green-yellow upon this chart may be balanced by noting their symbols, thus light green-yellow (GY8/6) balances dark purple (P2/3), when the areas are inversely as the product of the symbols, viz:--six parts of light green-yellow and forty-eight parts of dark purple.

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CHART
20

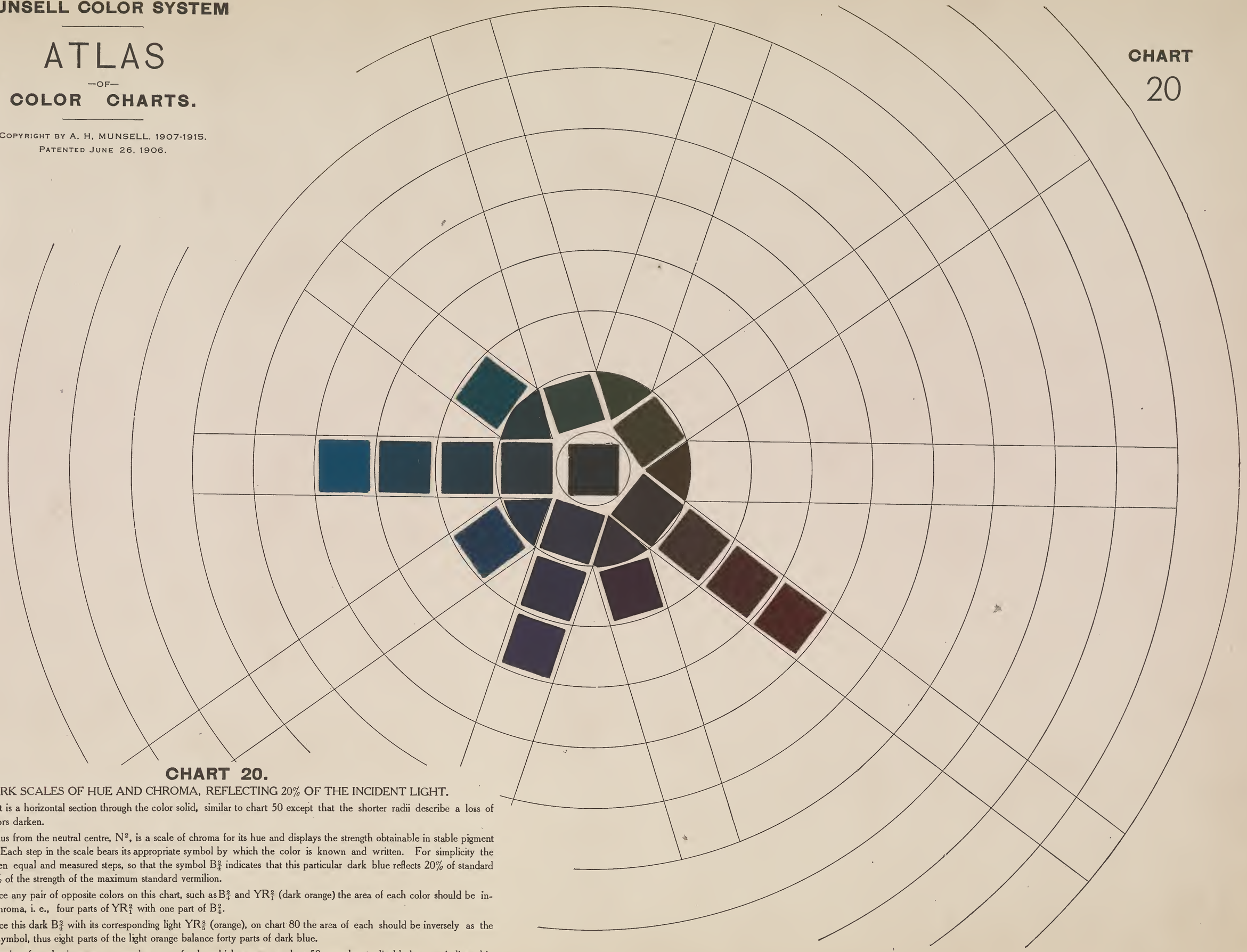

CHART 20.

DARK SCALES OF HUE AND CHROMA, REFLECTING 20% OF THE INCIDENT LIGHT.

This chart is a horizontal section through the color solid, similar to chart 50 except that the shorter radii describe a loss of chroma as colors darken.

Each radius from the neutral centre, N^2, is a scale of chroma for its hue and displays the strength obtainable in stable pigment at this level. Each step in the scale bears its appropriate symbol by which the color is known and written. For simplicity the scale is given ten equal and measured steps, so that the symbol $B\frac{2}{4}$ indicates that this particular dark blue reflects 20% of standard white and 40% of the strength of the maximum standard vermilion.

To balance any pair of opposite colors on this chart, such as $B\frac{2}{4}$ and $YR\frac{2}{1}$ (dark orange) the area of each color should be inversely as its chroma, i. e., four parts of $YR\frac{2}{1}$ with one part of $B\frac{2}{4}$.

To balance this dark $B\frac{2}{4}$ with its corresponding light $YR\frac{8}{5}$ (orange), on chart 80 the area of each should be inversely as the product of its symbol, thus eight parts of the light orange balance forty parts of dark blue.

The suggestions for selecting sequences and groups of color which appear on chart 50, are also applicable here, as indicated in Chapters III and IV of the hand book, "A Color Notation."

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CHART
30

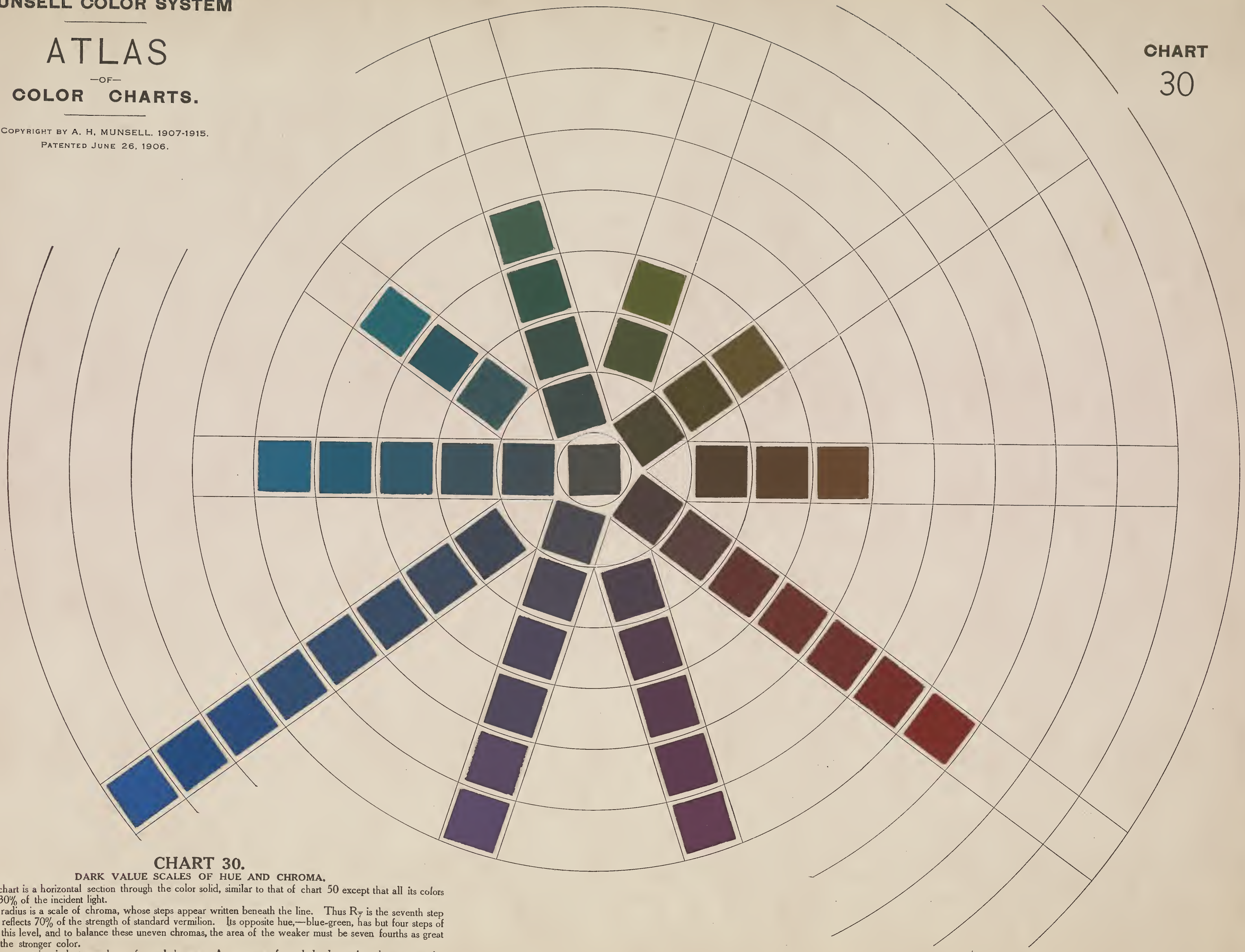

CHART 30.

DARK VALUE SCALES OF HUE AND CHROMA.

This chart is a horizontal section through the color solid, similar to that of chart 50 except that all its colors reflect but 30% of the incident light.

Each radius is a scale of chroma, whose steps appear written beneath the line. Thus R_7 is the seventh step of red and reflects 70% of the strength of standard vermilion. Its opposite hue,—blue-green, has but four steps of chroma at this level, and to balance these uneven chromas, the area of the weaker must be seven fourths as great as that of the stronger color.

Each concentric circle traces hues of equal chroma. A sequence of regularly decreasing chroma may be traced thus:—PB_8, RP_6, YR_4, GY_2, N^8. The suggestions on chart 50 may be applied to this chart as indicated in chapters III and IV of a "Color Notation."

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CHART
40

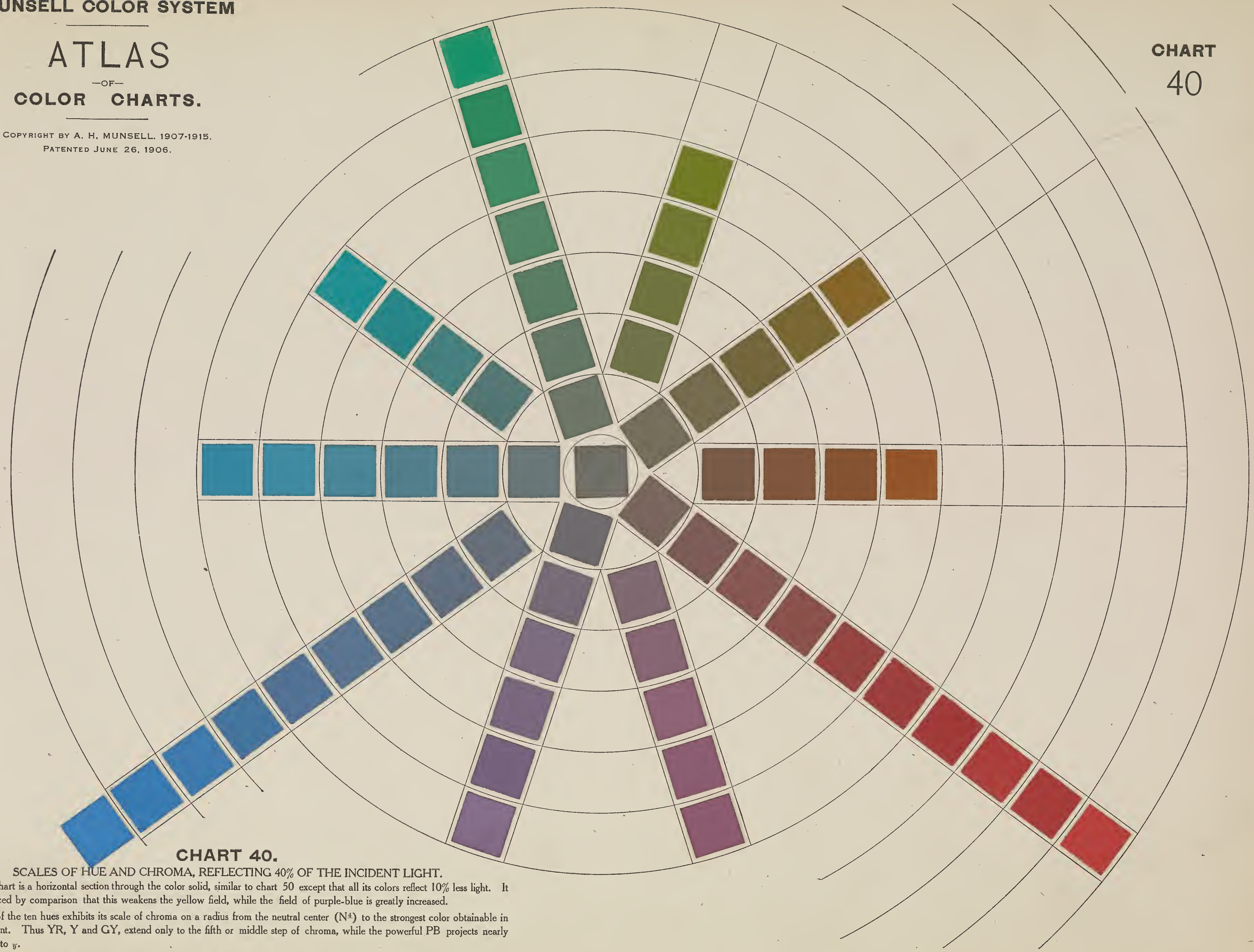

CHART 40.

SCALES OF HUE AND CHROMA, REFLECTING 40% OF THE INCIDENT LIGHT.

This chart is a horizontal section through the color solid, similar to chart 50 except that all its colors reflect 10% less light. It will be noticed by comparison that this weakens the yellow field, while the field of purple-blue is greatly increased.

Each of the ten hues exhibits its scale of chroma on a radius from the neutral center (N^4) to the strongest color obtainable in stable pigment. Thus YR, Y and GY, extend only to the fifth or middle step of chroma, while the powerful PB projects nearly twice as far to $_9$.

To balance the unequal chromas of any opposite pair, the areas must be proportioned to the symbols printed on the colors: thus nine parts of $Y\frac{4}{8}$ balances five parts of $PB\frac{4}{9}$. Each concentric circle traces equal steps of chroma through the ten hues, and the suggestions for making color sequences which appear on the other charts apply here also. See Chapters III and IV of "A Color Notation"

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MUNSELL COLOR SYSTEM

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COLOR CHARTS.

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CHART
50

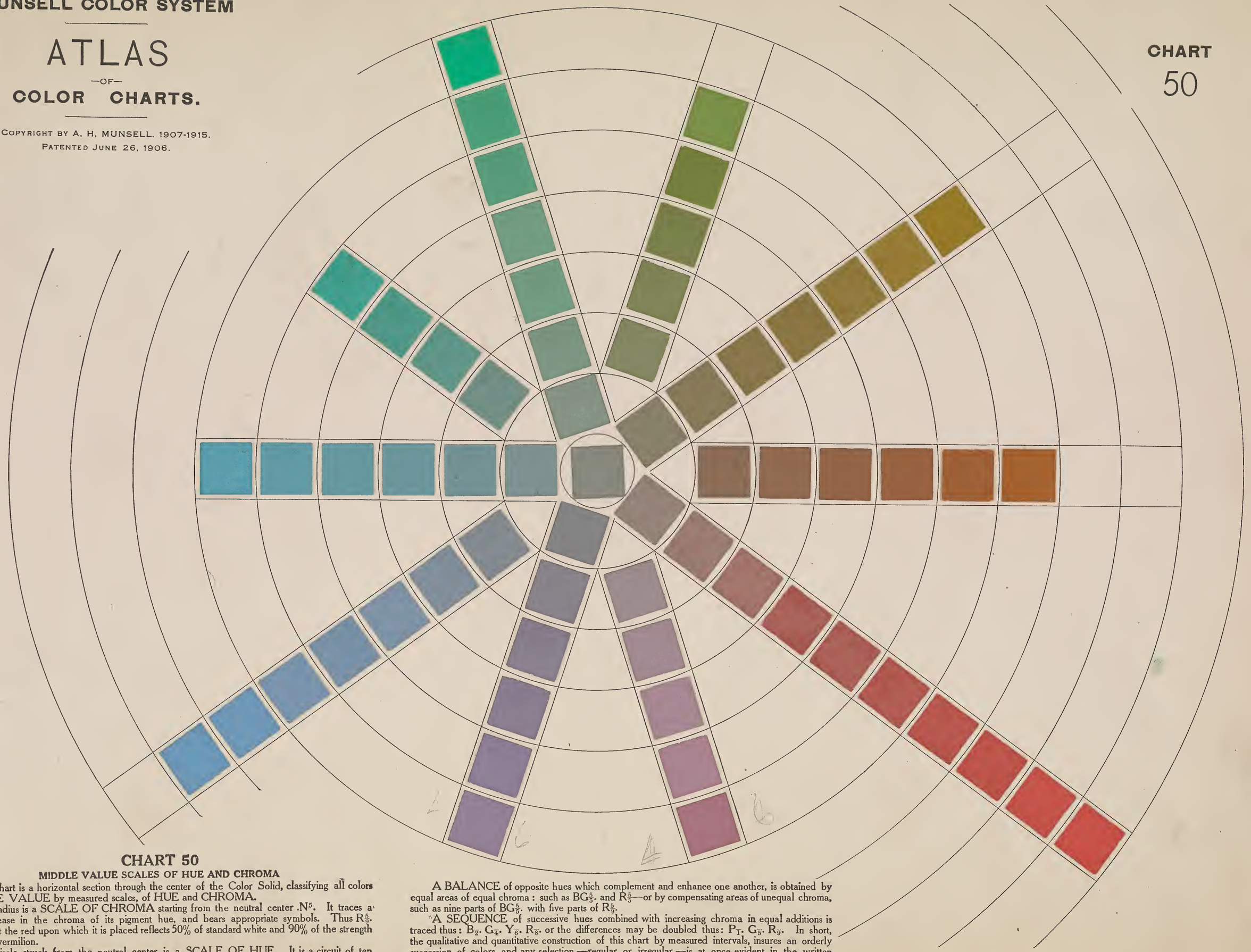

CHART 50

MIDDLE VALUE SCALES OF HUE AND CHROMA

This Chart is a horizontal section through the center of the Color Solid, classifying all colors of MIDDLE VALUE by measured scales, of HUE and CHROMA.

Each radius is a SCALE OF CHROMA starting from the neutral center N^5. It traces a regular increase in the chroma of its pigment hue, and bears appropriate symbols. Thus R^5_9. indicates that the red upon which it is placed reflects 50% of standard white and 90% of the strength of standard vermilion.

Each circle struck from the neutral center is a SCALE OF HUE. It is a circuit of ten measured hues, equal in value and chroma. This equality appears in their symbols, — R^5_5. YR^5_5. Y^5_5. GY^5_5. G^5_5. BG^5_5. B^5_5. PB^5_5. P^5_5 and RP^5_5. which is a balanced circle of hues reflecting 50% of standard white and 50% of the chroma of standard vermilion.

A BALANCE of opposite hues which complement and enhance one another, is obtained by equal areas of equal chroma: such as BG^5_5. and R^5_5—or by compensating areas of unequal chroma, such as nine parts of BG^5_5. with five parts of R^5_9.

A SEQUENCE of successive hues combined with increasing chroma in equal additions is traced thus: $B_{\overline{2}}$. $G_{\overline{4}}$. $Y_{\overline{6}}$. $R_{\overline{8}}$. or the differences may be doubled thus: $P_{\overline{1}}$. $G_{\overline{5}}$. $R_{\overline{9}}$. In short, the qualitative and quantitative construction of this chart by measured intervals, insures an orderly succession of colors, and any selection,—regular or irregular,—is at once evident in the written symbols. See Chapters III and VI of "A COLOR NOTATION," by the author, which describes the nature and use of these charts.

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CHART
60

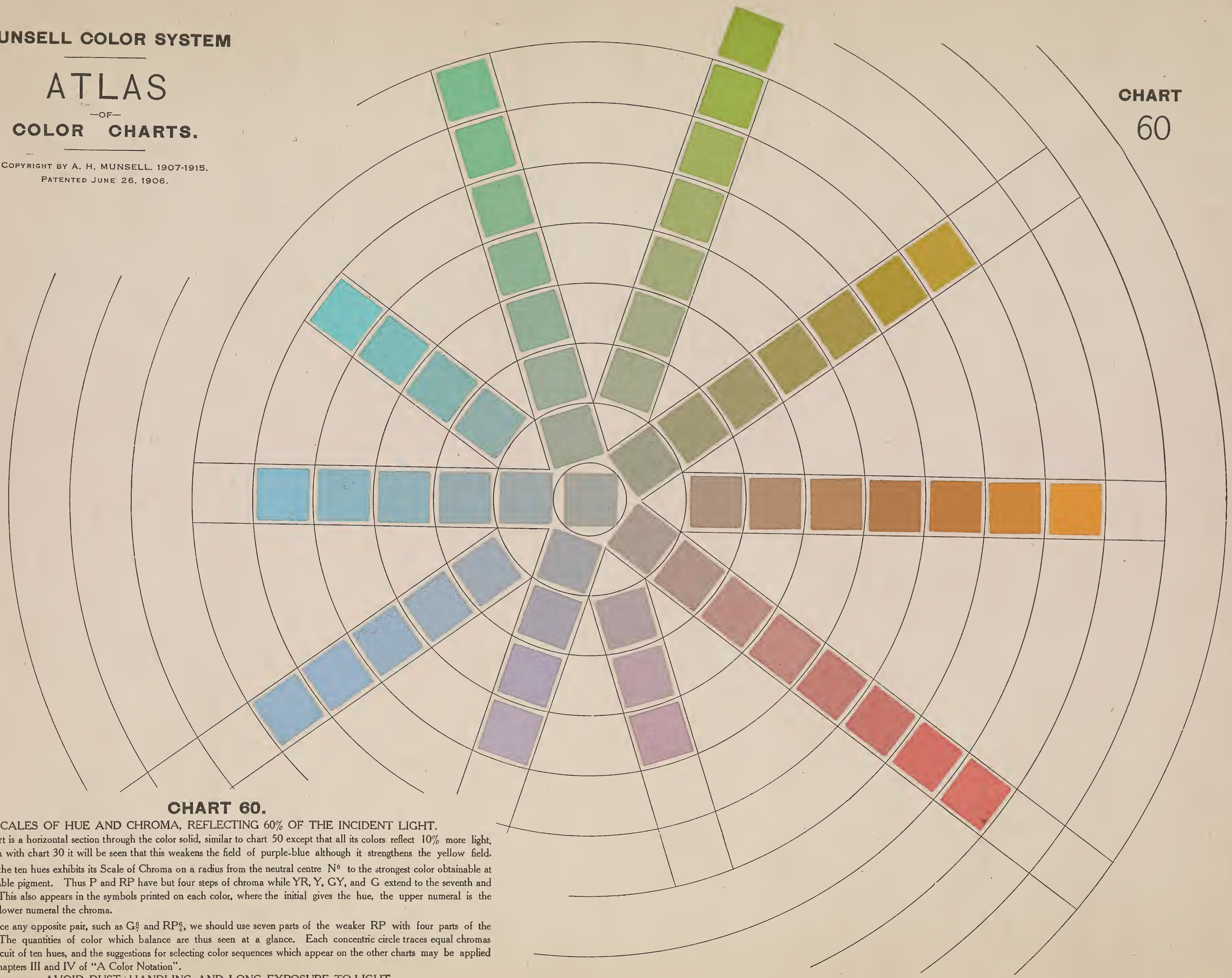

CHART 60.

SCALES OF HUE AND CHROMA, REFLECTING 60% OF THE INCIDENT LIGHT.

This chart is a horizontal section through the color solid, similar to chart 50 except that all its colors reflect 10% more light. By comparison with chart 30 it will be seen that this weakens the field of purple-blue although it strengthens the yellow field.

Each of the ten hues exhibits its Scale of Chroma on a radius from the neutral centre N^6 to the strongest color obtainable at this level in stable pigment. Thus P and RP have but four steps of chroma while YR, Y, GY, and G extend to the seventh and eighth step. This also appears in the symbols printed on each color, where the initial gives the hue, the upper numeral is the value and the lower numeral the chroma.

To balance any opposite pair, such as $G\frac{6}{7}$ and $RP\frac{6}{4}$, we should use seven parts of the weaker RP with four parts of the stronger G. The quantities of color which balance are thus seen at a glance. Each concentric circle traces equal chromas through the circuit of ten hues, and the suggestions for selecting color sequences which appear on the other charts may be applied here. See Chapters III and IV of "A Color Notation".

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CHART
70

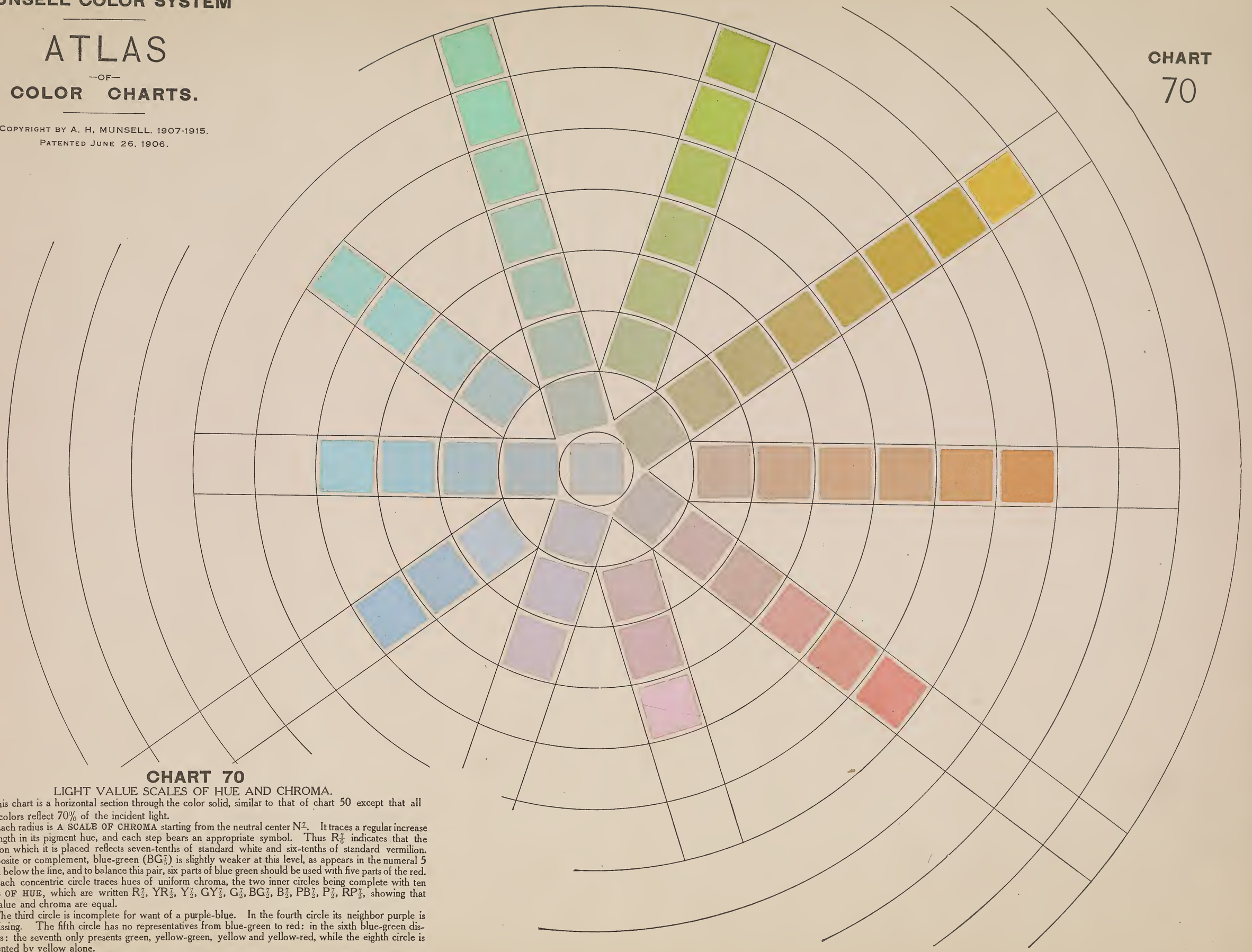

CHART 70

LIGHT VALUE SCALES OF HUE AND CHROMA.

This chart is a horizontal section through the color solid, similar to that of chart 50 except that all of its colors reflect 70% of the incident light.

Each radius is A SCALE OF CHROMA starting from the neutral center N^7. It traces a regular increase of strength in its pigment hue, and each step bears an appropriate symbol. Thus R^7_6 indicates that the red upon which it is placed reflects seven-tenths of standard white and six-tenths of standard vermilion. Its opposite or complement, blue-green (BG^7_5) is slightly weaker at this level, as appears in the numeral 5 written below the line, and to balance this pair, six parts of blue green should be used with five parts of the red.

Each concentric circle traces hues of uniform chroma, the two inner circles being complete with ten STEPS OF HUE, which are written $R^7_{\frac{1}{2}}$, $YR^7_{\frac{1}{2}}$, $Y^7_{\frac{1}{2}}$, $GY^7_{\frac{1}{2}}$, $G^7_{\frac{1}{2}}$, $BG^7_{\frac{1}{2}}$, $B^7_{\frac{1}{2}}$, $PB^7_{\frac{1}{2}}$, $P^7_{\frac{1}{2}}$, $RP^7_{\frac{1}{2}}$, showing that both value and chroma are equal.

The third circle is incomplete for want of a purple-blue. In the fourth circle its neighbor purple is also missing. The fifth circle has no representatives from blue-green to red: in the sixth blue-green disappears: the seventh only presents green, yellow-green, yellow and yellow-red, while the eighth circle is represented by yellow alone.

These radii describe the unequal strength of pigments at this level of the color solid and should be contrasted with chart 30 where the relations of strength and weakness are reversed.

For a study of balances and sequences on this chart see Chapters III and IV of "A Color Notation" by the author.

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CHART
80

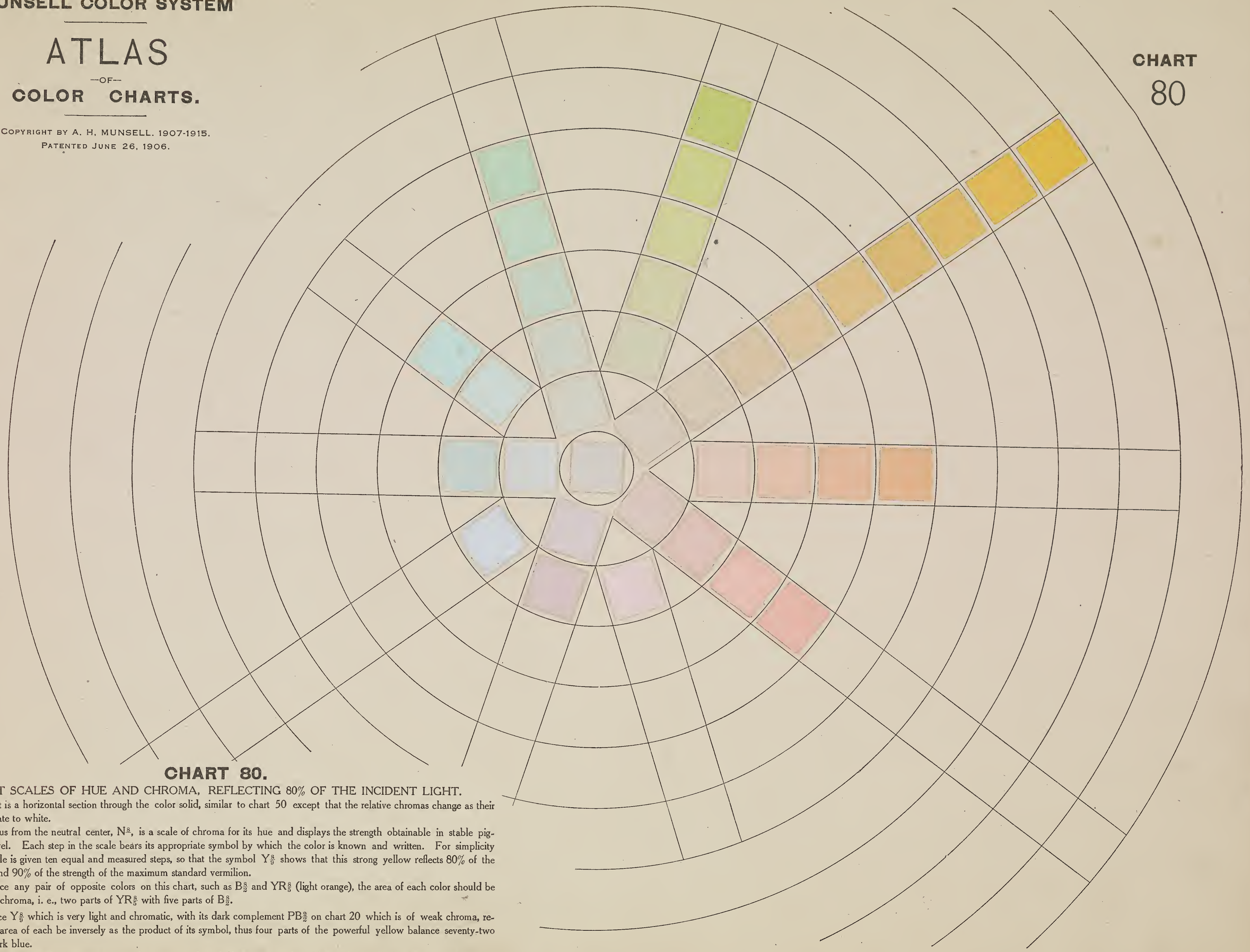

CHART 80.

LIGHT SCALES OF HUE AND CHROMA, REFLECTING 80% OF THE INCIDENT LIGHT.

This chart is a horizontal section through the color solid, similar to chart 50 except that the relative chromas change as their hues approximate to white.

Each radius from the neutral center, N^8, is a scale of chroma for its hue and displays the strength obtainable in stable pigment at this level. Each step in the scale bears its appropriate symbol by which the color is known and written. For simplicity the chroma scale is given ten equal and measured steps, so that the symbol Y^8_8 shows that this strong yellow reflects 80% of the incident light and 90% of the strength of the maximum standard vermilion.

To balance any pair of opposite colors on this chart, such as B^8_2 and YR^8_6 (light orange), the area of each color should be inversely as its chroma, i. e., two parts of YR^8_6 with five parts of B^8_2.

To balance Y^8_8 which is very light and chromatic, with its dark complement PB^8_{12} on chart 20 which is of weak chroma, requires that the area of each be inversely as the product of its symbol, thus four parts of the powerful yellow balance seventy-two parts of the dark blue.

The suggestions for selecting sequences and groups of color which appear on chart 50, are also applicable here, as indicated in Chapters III and IV of the handbook "A Color Notation."

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